

Overwintering sites and the larval stadia of two china mark moths (Lepidoptera, Crambidae)

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Abstract Overwintering sites and the larval stadia of two nymphuline species, *Elophila interruptalis* and *Neoschoenobia testacealis*, were examined at Midorogaike Pond, Kyoto, Central Honshu, by collecting their two host leaves, *Brasenia schreberi* and *Nuphar subintegerrimum* from late autumn, 1998 to early spring, 1999 and in November and December, 1999. *Elophila interruptalis* hibernated in the 3rd or 4th instar larvae within their cocoons, each with one piece of leaf fragment attaching to a leaf or rarely to a stem of *Brasenia schreberi*, while the larvae of *Neoschoenobia testacealis* were inside the submerged leaves or in the petioles of *Nuphar subintegerrimum* at the 2nd instar. The larvae of both species began to develop in April, depending on new floating leaves.

Key words Crambidae, *Elophila interruptalis*, *Neoschoenobia testacealis*, overwintering, aquatic plants.

There is little information about the overwintering sites and larval developmental stages of hibernating aquatic moths because of the difficulty of examining the insects around the water. Yajima (1949) estimated the larval overwintering place of *Elophila interruptalis* (Pryer) could be on wet ground around ponds, and Nagasaki (1981) explained that the hibernation for *Elophila interruptalis* and *Neoschoenobia decoloralis* Hampson* would be on the pond bed with the host plants at Midorogaike Pond, Kyoto, Central Honshu. However, no detailed survey has been done on the overwintering sites and the larval stadia during the winter. We examined the host plants of *E. interruptalis* and *N. testacealis* to investigate the overwintering of these two nymphuline moths in the same pond as Nagasaki (1981). The biotic community in the pond must not be disturbed since it is a natural conservation area, so that we got the permission to collect the plants from the Board of Education of Kyoto City, to the staffs of which we acknowledge a considerable debt.

Materials and methods

(1) Investigation plot

We collected the materials from a southern plot of Midorogaike Pond (ca 90,000 m², 80 m asl) (Fig. 1A), situated in the northern part of Kyoto City. Though there are 4 aquatic moths, *Elophila interruptalis*, *E. turbata*, *Neoschoenobia testacealis* and *Parapoynx rectilinealis*, in the pond, *E. interruptalis* and *N. testacealis* inhabit this plot.

(2) Collecting materials and methods to identify the larval stadia

The leaves of two common host plants of the two nymphuline species, *Brasenia schreberi* and

*Recently Speidel & Mey (1999) treated *Neoschoenobia decoloralis* Hampson, 1911 as a junior synonym of *Neoschoenobia testacealis* Hampson, 1901.

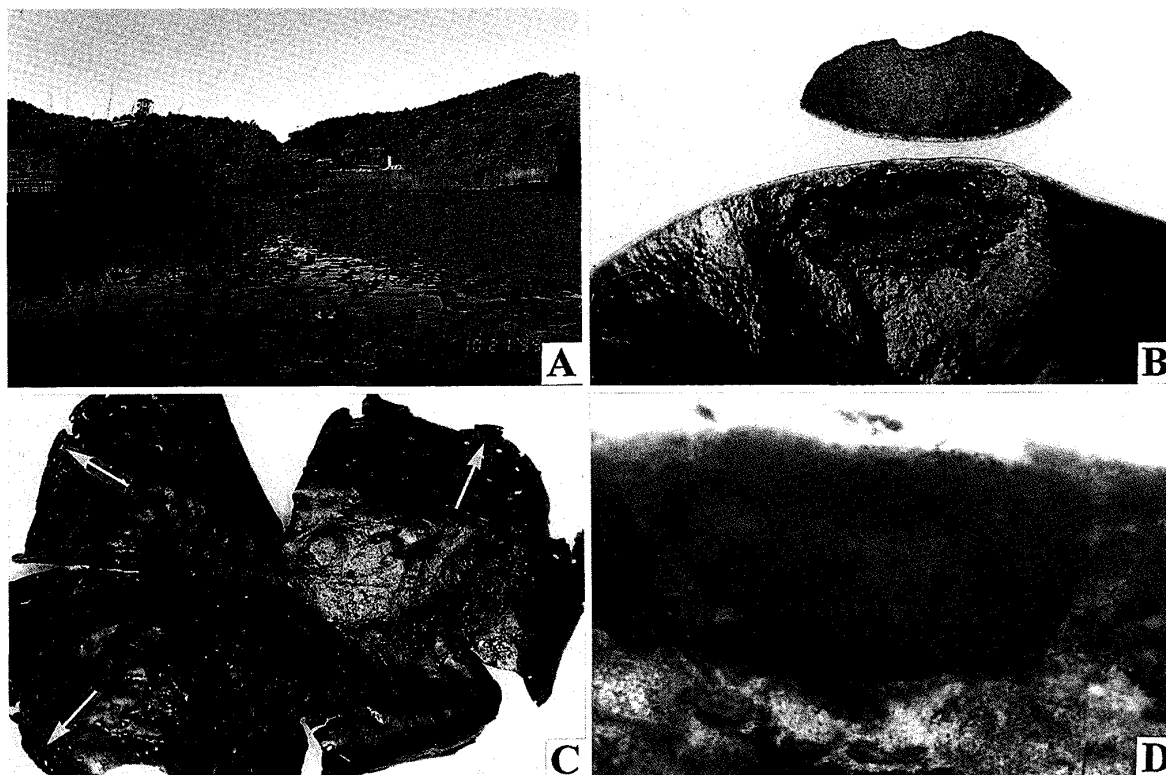


Fig. 1. A. Midorogaike Pond in autumn. B. A larva of *Elophila interruptalis* in cocoon attaching one piece of host leaf on *Brasenia schreberi* (a leaf fragment above removed). C. A leaf of *Nuphar subintegerrimum* with positions of *Neoshoenobia testacealis* larvae (indicated by arrows). D. A larva of *N. testacealis* inside the leaf of *Nu. subintegerrimum*.

Nuphar subintegerrimum, were cut from around the roots once a month from November, 1998 to April, 1999 and from November to December, 1999. From December to next March the leaves remained in the water (submerged leaves), but in spring and late autumn we also examined the floating leaves. We collected both types of leaves when available. After bringing back the leaves to the laboratory, they were separated by the parts, leaf itself and petiole, and then we counted all the larvae present on each part. Then we measured head widths of the larvae under the binocular microscope to determine the larval stadia, based on the former report in Yoshiyasu (1985) that *E. interruptalis* passes 6 larval stadia and *N. testacealis* does 7 larval stadia.

Results and discussion

(1) Overwintering of *Elophila interruptalis*

The overwintering larval stadium of this species was estimated as mid-instar (Yajima, 1949) and as the 4th instar (Nagasaki, 1981). However, there were both the 3rd and 4th instar larvae during the winter based on the present survey (Table 1), although the individuals of the 4th instar were about twice as large in number as those of the 3rd instar. Most larvae were found inside the rather tight cocoons, each with a leaf fragment attaching to the leaf surface of *Brasenia schreberi* (Fig. 1B). A few larvae were discovered on *Nuphar* leaves. Consequently, the overwintering site of this species was confirmed to be on the host plants

Table 1. Numbers and larval stadia of two nymphuline species overwintering in 1998 and 1999.

moth species	host plant	kind of leaves	sampling date								
			1998		1999						
			Nov. 27	Dec. 26	Jan. 30	Feb. 23	Mar. 28	Apr. 30	Nov. 6	Dec. 10	Dec. 31
<i>Elophila interruptalis</i>	<i>Brasenia schreberi</i>	F	(6) ③ 3 ④ 4	-	-	-	-	(14) ③ 2 ④ 5 ⑤ 3	(18) ① 2 ② 1 ③ 7 ④ 3	(22) ② 1 ③ 6 ④ 5	-
			-	(8) ③ 1 ④ 6	(10) ③ 4 ④ 4	(11) ③ 2 ④ 8	(15) ④ 2	-	(20) 0	(25) ② 2 ③ 2 ④ 7	(24) ③ 2 ④ 3
			(3) 0	(5) 0	-	-	-	(5) 0	(10) ③ 1 ④ 3	(10) ③ 2 ④ 2	(10) ④ 2
	<i>Nuphar subintegerrimum</i>	S	(3) 0	(5) 0	(10) ③ 1	(10) ④ 1	(10) 0	(5) 0	(10) 0	(10) 0	(10) ③ 1
			(6) 0	-	-	-	-	(14) 0	(18) 0	(22) ② 1	-
			-	(8) 0	(10) 0	(11) 0	(15) 0	-	(20) 0	(25) ② 2	(24) 0
<i>Neoschoenobia testacealis</i>	<i>Brasenia schreberi</i>	F	(3) ② 5	(5) ② 6	-	-	-	(5) ② 9 ③ 28 ④ 4	(10) ① 2 ② 45	(10) ② 2	(10) ② 3
			(3) 0	(5) ① 1	(10) ② 73	(10) ② 59	(10) ② 106	(5) ② 14 ③ 1	(10) ② 2 ① 1 ② 1	(10) ② 8 ② 1	(10) ② 2 ② 4
			(3) 0	(5) ① 1	(10) ② 73	(10) ② 59	(10) ② 106	(5) ② 14 ③ 1	(10) ② 2 ① 1 ② 1	(10) ② 8 ② 1	(10) ② 2 ② 4
	<i>Nuphar subintegerrimum</i>	S	(3) 0	(5) ① 1	(10) ② 73	(10) ② 59	(10) ② 106	(5) ② 14 ③ 1	(10) ② 2 ① 1 ② 1	(10) ② 8 ② 1	(10) ② 2 ② 4
			(3) 0	(5) ① 1	(10) ② 73	(10) ② 59	(10) ② 106	(5) ② 14 ③ 1	(10) ② 2 ① 1 ② 1	(10) ② 8 ② 1	(10) ② 2 ② 4
			(3) 0	(5) ① 1	(10) ② 73	(10) ② 59	(10) ② 106	(5) ② 14 ③ 1	(10) ② 2 ① 1 ② 1	(10) ② 8 ② 1	(10) ② 2 ② 4

*Numbers in parentheses show floating (F) and submerged (S) leaves examined.

Numbers in circles indicate larval stadia.

in the water neither in the pond shore nor in the pond bed. Each cocoon of the larval case contains a bubble of air through which the larva can respire. In April the overwintering larvae probably move to new *Brasenia* leaves and develop on them (see larval instars collecting on 30 April, 1999 in Table 1).

(2) Overwintering of *Neoschoenobia testacealis*

The larvae have a leaf-mining and petiole-boring habit, mainly feeding on *Nuphar subintegerrimum* (Nagasaki, 1981; Yoshiyasu, 1985). From spring to autumn the larvae were inside the leaves or petioles, but from late December to next March the larvae were found just under the leaf epidermis along a leaf edge (Figs 1C, 1D) and some were inside the petioles as the 2nd instar larvae (Table 1). In neither case did they spin silk as *E. interruptalis*. Most specimens were from *Nu. subintegerrimum*, but some were from *B. schreberi* in the water. So the overwintering stage was confirmed to be the 2nd instar larva as suggested by Nagasaki (1981). From May to October, we could find few larvae in the submerged leaves (unpublished data), so the overwintering larvae seem to move from the floating leaves to submerged ones in late Autumn, and the following April they transfer to the newly

developed floating leaves, as the former species.

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摘 要

ミズメイガ2種の越冬場所とその幼虫齢期 (鱗翅目, ツトガ科) (吉安裕・鴨志田徹也)

京都市深泥池において, 1998年11月-1999年4月及び1999年11月と12月に, マダラミズメイガ *Elophila interruptalis* とミドロミズメイガ *Neoschoenobia testacealis* の越冬場所 (部位) とその発育段階を調査した. 約1か月に1回, 両種の共通の寄主であるジュンサイとヒメコウホネの葉を根部付近から切り取り, ヒメコウホネは葉と葉柄に分けて, それぞれの部位にいる幼虫を採集した. 越冬している幼虫齢期を確かめるため, 全個体の頭幅を実体顕微鏡下で計測した. その結果, 越冬期間中のマダラミズメイガは3齢か4齢幼虫でジュンサイの葉に切り取った1枚の葉片をつけて, 比較的堅固な繭をつむいで中に静止していた. 一方, ミドロミズメイガは2齢幼虫で越冬し, ヒメコウホネの葉縁で表皮下に潜っているか, 葉柄に穿孔していた. いずれの場合も, 繭はつむいでいなかった. この両植物は晩秋の11月から12月中旬頃までは浮葉があるので, そこにも一部の個体が見られたが, 1-3月には浮葉がなく, 2種とも水中の葉から発見された. 4月に浮葉があらわれると, 越冬幼虫はそれに移動して摂食・発育をはじめると考えた.

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